

## GLACIALLY - TRIGGERED FAULTING

Glacially triggered faulting describes movement of pre-existing faults caused by a combination of tectonic and glacially induced isostatic stresses. The most impressive fault scarps are found in Northern Europe, assumed to have been reactivated at the end of deglaciation. However, this view has been challenged as new faults have been discovered globally with advanced techniques such as LiDAR, and fault activity dating has shown several phases of reactivation thousands of years after deglaciation ended. This book summarizes the current state-of-the-art research in glacially triggered faulting, discussing the theoretical aspects that explain the presence of glacially induced structures and reviews the geological, geophysical, geodetic and geomorphological investigation methods. Written by a team of international experts, it provides the first global overview of confirmed and proposed glacially induced faults and provides an outline for modelling these stresses and features. It is a go-to reference for geoscientists and engineers interested in ice sheet–solid earth interaction.

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## Preface

On cloudless summer days in Northern Europe one may spot a small plane crossing the sky like a farmer tilling a field. This plane may be collecting data for a digital elevation model using laser scanning.

During analysis of novel digital elevation data in the early 2010s, a peculiar feature in the form of an almost north–south-oriented lineation was found near the town of Bollnäs in Sweden, approximately 250 km north of Stockholm. After additional investigation on the ground, a glacially induced fault was identified. This was surprising, since the location is more than 400 km south of the area with the prominent scarps of all the glacially induced faults known at that time.

As more faults were identified later in Sweden and Finland with this type of new data, a series of Postglacial Fault Symposia (2015 in Uppsala, Sweden; 2016 in Turku, Finland; 2018 in Kautokeino, Norway) were organized to provide a fruitful forum for the exchange of the newest research results.

In addition, the Postglacial Fault Drilling Project was initiated in 2010 through a workshop in Skokloster, Sweden, funded by the International Continental Scientific Drilling Program. It was recognized that a glacially induced fault represents a special kind of intraplate fault zone. The full drilling proposal, ‘Drilling Active Faults in Northern Europe’ (DAFNE), was approved in October 2019.

In 2016, in view of the many new results and the planned drilling, the participants of the Postglacial Fault Symposium decided to summarize the findings of the last 50 years up to the present day in a book to be entitled *Glacially-Triggered Faulting*. Two editors were proposed: Robert Lagerbäck and Odleiv Olesen.

Sadly, Robert Lagerbäck had to decline his editorship and passed away in August 2018. Robert Lagerbäck was employed at the Geological Survey of Sweden (SGU) and was the key researcher on the so-called postglacial faults in northern Fennoscandia for more than three decades. In the 1980s, Robert was one of the key persons to map these faults within the Nordkalott Project. With his death,

we lost a renowned geologist, whose expertise was often missed during this book's preparation. We hope he would have liked the final product.

We would like to thank all authors and reviewers of the book and the chapters, and we thank the contributors to the *International Database of Glacially Induced Faults*, by Munier et al. (2020), which is available for download at the *PANGAEA* website, [doi.org/10.1594/PANGAEA.922705](https://doi.org/10.1594/PANGAEA.922705).

This book could not have been edited without them. In addition, we are very grateful for the excellent assistance by Susan Francis and Sarah Lambert from Cambridge University Press during the preparation of this book.

We hope the reader will find this book the ideal reference in the field of glacially triggered faulting. It should also serve as the best comprehensive start for a new generation of scientists working on glacially induced faults.

And finally, during the writing of this book, the authors welcomed at least five new arrivals. Perhaps they will form the next generation of researchers investigating glacially induced faults. There is still much to do. Data collection and research will continue; there will be many more cloudless days in Northern Europe and elsewhere. The next time you see a small plane crossing the sky like a farmer tilling a field, imagine that it may be collecting the data that will help unravel another secret of glacially triggered faulting.



Robert Lagerbäck leading his 2012 fault excursion at the Lansjärv site, northern Sweden (Photo: Raimo Sutinen).